plateau resources
LIMITED

General Office: 772 Horizon Drive, Grand Junction, CO 81501 (303) 245-5460
Corporate Office: 212 West Michigan Avenue, Jackson, MI 49201 (517) 787-8415
Registered Office: 141 East First South, Salt Lake City, UT 84111 (801) 534-0734

April 6, 1979

Mr. Ron Daniels
State of Utah
Division of Oil, Gas & Mining
1588 West North Temple
Salt Lake City, Utah 84116

Dear Ron:

A mine and mill reclamation plan was submitted to your office on January 25, 1979 for approval.

Attachment number 4 to the reclamation plan was taken from text which was later revised and submitted to the Nuclear Regulatory Commission. Accordingly, I have revised attachment number 4 and marked the changes for your convenience.

Also, it was felt by our processing personnel that you might have an interest in the tailings underdrainage system. I have enclosed a copy of a letter dated December 5, 1978 from Woodward-Clyde Consultants to the NRC explaining this system in detail as a response to some of their questions during the preparation of our Draft Environmental Statement.

Should you have any questions about this system, please do not hesitate to contact me.

Sincerely,

Pam Newman

Pam Newman
Administrative Assistant

PN
enclosures
cc: Mr. R. B. Sewell

ATTACHMENT #4

PLATEAU RESOURCES LIMITED
SHOOTERING CANYON PROCESSING FACILITY

RECLAMATION AND RESTORATION

The purpose of a reclamation program is to restore lands disturbed by project activities to a productive condition consistent with past and present uses of the area. This generally consists of restoring landscape contours to slopes similar to predisturbance conditions and replacing a sufficient thickness of topsoil to enable native vegetation to become reestablished whenever possible. Reclamation of the tailings impoundment will include measures to reduce the emanation of radon to a level about twice that which naturally emanates from soils in the vicinity.

Several characteristics of the project area, and southeastern Utah in general, are considered nonconducive to the rapid reestablishment of native plant species on disturbed areas. The most significant factors are the arid climate and the poorly developed soil. The low average annual precipitation; frequent droughts; extreme temperatures; high wind erosion; and a loose, undifferentiated soil profile with poor moisture-holding capacity and little organic content contribute to inherent reclamation problems in the area.

Based on the types of disturbances anticipated, the environmental characteristics of the area, the present and proposed land uses, and the state-of-the-art knowledge on reclamation in arid environments, reclamation of areas disturbed by the project will consist of the following procedures:

-Cover and stabilize the tailings impoundment
-Remove structures and regrade or reshape disturbed areas to blend with surroundings
-Replace topsoil material in areas amenable to plant growth
-Revegetate disturbed areas using native species

Revised Attatchment #4

PRESENT AND PROPOSED USE OF THE LAND

Historically, the project area has been used for seasonal grazing of livestock and as wildlife habitat. Human use of the project area for activities such as camping, hiking, sightseeing, and hunting has been minimal to date, although other areas in southeastern Utah are important for one or more of these activities.

Livestock grazing and wildlife habitat will probably continue to be the principal uses of the affected area after termination and closure of the proposed project. Agricultural use of the area, for either crop or hay production, is not anticipated due to the poor soil structure and scarcity of water. There are presently no urban or industrial developments in the project area; and other than the facilities related to the proposed project, none are planned for the future.

The purpose of the reclamation program is to restore those lands disturbed by project activities to an acceptable condition for livestock grazing and wildlife habitat. Since the existing vegetation is generally sparse, and is dominated by widely spaced shrubs and by relatively few grasses that produce useful amounts of forage, successful reclamation in the project area will result in the establishment of sparse vegetation with generally low forage production.

LANDS DISTURBED FOR ORE PROCESSING PLANT

Approximately 18 acres will be graded before construction of the ore processing facility. For approximately 90 percent of that area, grading will involve excavation to develop smooth, nearly level surfaces. Filling will be required over the balance of the graded area. Typically, cuts will range from zero to about 15 feet in depth, except in localized areas (such as the ore crushing structure and connecting conveyor tunnel) where excavation will be as deep as 45 feet. Maximum fill depth will be approximately 40 feet at a corner of the ore storage patio. Unsupported cuts and fills will be sloped at two horizontal to one vertical (2:1).

At project termination all plant structures and facilities will be dismantled and removed from the plant area. Structural foundations, tank containment dikes, and other elements extending above the general grade of the plant site will be leveled, and probably will be used to fill

depressions within the plant area, such as the excavation for the ore crushing structure. All depressions within the plant site will be filled and the general surface gradient of the graded area will be maintained so that all runoff from the area will continue to flow to the tailings impoundment area. After this general leveling is completed, the entire plant area will be covered to a depth of about 1 foot with previously stockpiled topsoil, fertilized and seeded to promote the establishment of native vegetation. Plant species to be seeded include: sage (Artemisia spp.), Indian ricegrass (Oryzopsis hymenoides), and Mormon tea (Ephedra), if available. A plant population density commensurate with that of the surrounding undisturbed area may be achieved in this way.

An area adjacent to the plant site will be cleared and graded for use as a construction equipment and materials storage yard. Additional contiguous land may be graded and cleared for temporary housing purposes if the Ticaboo Subdivision is not completed in time to be used by plant construction workers. When plant construction is completed, the construction yard and housing area will be closed, all structures and equipment will be removed, the area will be regraded to conform with the general topography of its surroundings, and disturbed areas will be fertilized and seeded with native plant species as indicated above for the plant site.

CLOSURE OF TAILINGS IMPOUNDMENT

Reclamation and restoration of the impoundment area will progress throughout the operating life of the ore processing facility, and will be concluded promptly after the termination of the processing operations. The tailings management plan for the project is designed to take advantage of the tendency of the sand and slimes fractions in the tailings to segregate during placement. Tailings will be delivered by pipeline to the impoundment area, and will be discharged through carefully placed and operated distributor pipes. The discharge pipes probably will be placed

at the elevation of the full impoundment and frequently repositioned so that they will remain at the perimeter of the impoundment as it fills. Discharged tailings will flow down the slopes of the impoundment basin; the sand fraction will be deposited near the discharge points, while the slimes will flow toward the lowest part of the basin. As filling progresses, the pipes will be repositioned to continuously extend the tailings sand beach at the level of the full impoundment and the resulting new sand beaches will be reclaimed by constructing the required cap.

It is expected that enough water may be withdrawn from the slimes by evaporation to stabilize them to the extent that they will not be displaced from the bottom of the impoundment basin by the subsequent placement of additional tailings. An important variable in the tailings placement operation is the location of the spigot discharge. By varying the distance between the point of discharge and the low part of the basin, the exposure of the flowing slimes to the atmosphere can be varied. Properly controlled discharge positions should result in well-dewatered slimes collecting in the low part of the tailings basin. Thus, at the end of the project life, a large mass of liquid slimes will not be concentrated in the central portion of the impoundment area, and there should be no difficulty in completing the cap to be placed over the entire impoundment area. By continuously stabilizing the tailings slimes as they are discharged into the impoundment, it will be possible to provide the maximum feasible burial of that portion of the tailings containing the preponderant part of the radionuclides. Also, this disposal technique should result in a well-consolidated, dense mass of low porosity, which will be effective in limiting the emanation of radon gas from the tailings.

Present plans are to construct the cap over the tailings using -3- materials. The cap will be a minimum of 9 feet thick. A 6-foot-thick layer of clayey material will be placed immediately over the tailings. This material will be compacted to at least 95 percent of Standard Proctor Density. A 2-foot-thick layer of locally available sandy soil material is to be placed on top of the clay, and it too will be well compacted. To provide the necessary surface stability against wind

erosion, special care will be exercised to obtain a concentration of gravel and small rocks in the upper additional 1 foot of the cap.

It is noted that optimization in the design and construction of caps for uranium mill tailings is an evolving technology. Therefore, the plan for capping tailings from the Shootering project presented here is tentative. When the time comes to construct the cap, the best technology then available for the purpose will be employed. Since the cap construction will continue throughout most of the project operating life, this project will provide excellent opportunities for contributions to the evolution of the technology.

At this time it is not certain that net benefits may be realized by establishing vegetation over closed tailings impoundments in semiarid regions, such as the Shootering project area. With a well-established vegetative cover, water losses from the cap due to evapo-transpiration will be greater than evaporation losses from a similar cap without vegetation. It seems quite certain that maintaining as much water as possible in both the cap and the underlying tailings is beneficial in controlling radon emissions from the tailings. The surface layer of gravel and rock required on the cap to prevent wind erosion is not conducive to plant growth. It is expected that there will be continuous accretion to the tailings cap at Shootering due to retention of sediments carried onto the cap by runoff from the small tributary watershed of the basin (approximately 220 acres above the impoundment dam). The tailings cap and impoundment dam will be protected from runoff-caused erosion by a spillway to be excavated in the sandstone abutment of the dam. This spillway will have an overflow crest about 3 feet higher than the level of the completed tailings cap. Until sediments have accumulated on the cap to the level of the spillway crest, it is expected that spillway discharge will be a rare event. As sediments accrue on the cap, seeds of plants native to the area will also find their way onto the cap and natural processes will then establish a vegetative cover typical of the area on the cap. Experimental seeding of those portions of the cap constructed during the early part of project operations should

indicate whether a complete vegetative cover on the cap should be encouraged immediately after the cap is placed or if natural processes are preferable for this aspect of the project restoration program.

COSTS FOR PROJECT CLOSURE

After termination of uranium mine and processing facility operations, the surface structures and foundations will be removed from the site so the area can be reclaimed. Trash and nonsalvageable materials will be buried. Disturbed areas that will be reclaimed will be graded and topsoil will be replaced to promote revegetation. Sale of some of the equipment and materials will aid in recovery of a portion of the decommissioning cost; however, the cost of decommissioning the uranium mine and the processing facility in Shootering Canyon is estimated to be on the order of $250,000 for each element for a total estimated cost of $500,000.

A general plan for decommissioning of the processing facilities and ancillary structures will be submitted to NRC toward the end of project operations.

LONG-TERM SURVEILLANCE, MAINTENANCE, AND CONTROL OF TAILINGS DISPOSAL AREA

The design, construction, operation, and closure of the Shootering Canyon tailings disposal system have been planned with the objective of creating a facility that, after closure, will endure for many years without requiring either monitoring or maintenance while continuing to provide an environmentally safe and satisfactory service. However, the operation of the disposal system will be observed for five years after closure to ensure that the system is performing as intended. Accordingly, a proposed monitoring program is described in the following paragraphs. It is planned that monitoring will continue for five years after the tailings impoundment is closed. If there are any deficiencies in the system performance, they are expected to become apparent during the monitoring period and to be corrected before the monitoring program is terminated.

Factors of long-term concern with respect to uranium tailings may be summarized as follows:

-Tailings dispersal by erosion
-Contamination of groundwater
-Radon release to the atmosphere

TAILINGS DISPERSAL BY EROSION

Erosion by Water - The Shootering Canyon uranium project tailings impoundment dam will be designed and constructed with a crest extending above the maximum water level that would be reached in the impoundment area under the conditions of the maximum probable precipitation likely to occur at the site. A spillway around the left (east) abutment of the dam will divert runoff exceeding the retention capacity of the impoundment. The spillway crest will be about 3 feet higher in elevation than the top of the cap to be placed over the tailings, and the dead storage volume provided over the cap and below the spillway crest must be filled before any runoff is passed downstream from the dam. This storage is provided to maximize the capture of available moisture and thereby keep the tailings perpetually moist or wet for purposes or reducing radon emissions without reducing the safety of the structure. Overtopping of the dam crest, with consequent possible erosion, will be prevented by the spillway. The toe of the dam will be protected from erosion during periods of spillway discharge. The downstream face of the dam will not be eroded by incident rainfall.

Surveillance required to establish that the dam will continue to perform as designed (no overtopping) will include visually checking the spillway channel to see that it is unobstructed. Wind-deposited sand into the channel, rock falls or slides from the walls of the channel, and heavy vegetative incursions into the channel are conceivable types of obstructions. Channel maintenance would involve removal of such obstructions.

The dam will be constructed on a sandstone foundation. The techniques to be employed in construction of the dam will yeild a stable and

dense structure. Some deflection in both the vertical and downstream directions must be expected, however, when the dam is subjected to the intended loads. Although not expected to be significant, normal settlement under and within the dam will cause the crest of the dam to deflect with respect to the level of the spillway crest. If any settlement is noted by periodic inspections, it may be necessary to make instrument measurements to determine the amount of settlement and the consequent risk of dam overtopping. Settlement on the order of a foot or more would require a geotechnical investigation to determine the causes of the settlement. Nominal settlement due merely to internal consolidation of the dam after project closure could be remedied by adding a small amount of material to the crest, to prevent possible overtopping during heavy precipitation. Major settlement due to any cause would probably require an engineered remedy after the causes of the settlement were established. To prevent dispersal of project tailings by water erosion, it is necessary that the dam not be subjected to substantial and prolonged overtopping.

Erosion by Wind - The rock and gravel zones on the downstream slope and crest of the dam, and the rock and gravel layer to be placed at the top at the tailings cap, will prevent wind erosion of those exposed surfaces. It is expected that the thickness of the tailings cap will increase over time due to deposition of sediments transported onto the cap by runoff from the catchment area. Also, because the tailings disposal basin is effectively surrounded by natural cliffs and hills, it is expected that there will be net deposition of windborne soils over the impoundment area, rather than loss of covering over the tailings due to wind erosion. Accordingly, natural deposition will be exploited to enhance the security of the projected tailings impoundment.

Surveillance or monitoring required to determine the effects of wind on the tailings impoundment will be by visual inspection of the dam and the tailings disposal area. If there are any signs of local erosion, rather than deposition, locally available igneous rocks may be placed in the eroding areas to improve the erosion resistance of the

surface.

GROUNDWATER CONTAMINATION

The tailings management plan for the Shootering Canyon uranium plant has been developed to prevent contamination of groundwater underlying the tailings disposal area. Before tailings are placed in the basin, a clay blanket will be placed over the natural sandstone of the impoundment area to limit the rate of seepage from the tailings into the foundation rock. To reduce the amount of tailings liquids available for seepage from the impoundment, tailings will be distributed around the basin, in such a manner as to continuously provide a large wetted area exposed for evaporation. Also, if excess tailings liquids collect in the impoundment, they may be recycled to the process circuit or recirculated within the basin to increase evaporation. By keeping the tailings wet during and after placement, wind erosion and dispersion of the tailings can be minimized.

At the project site net evaporation from exposed water surfaces will average approximately 40 inches per year, which is equivalent to about 2.06 gallons per minute per acre of exposes surface. At an ore processing rate of 750 tons per day, and assuming a tailings slurry containing 45 percent solids by weight, approximately 153 gallons per minute of tailings liquids will be delivered to the impoundment. Saturated, dense, settled tailings would be expected to have a moisture content of not less than 35 percent. Based on this assumption, approximately 67 gallons per minute of the tailings liquids will be retained in the settled tailings, leaving approximately 86 gallons per minute of liquid available for evaporation and seepage from the pond. Keeping about 42 acres of the impoundment area continuously wetted should make it possible to dispose of practically all surplus tailings liquid by evaporation, leaving little available for seepage toward the ground water surface, which is at least 90 feet below the lowest point of the tailings impoundment basin. It should be noted that about 68 acres will be exposed in the impoundment area at the full basin contour level.

Since the tailings management plan provides a means for disposing of all excess tailings liquids during the project operation, no significant amount of free tailings liquid will remain in the impoundment at project termination to seep into the groundwater. Also, after the project is terminated, normal evaporation from the tailings cap will dispose of much of the incident precipitation, including runoff from the basin watershed, on the impoundment basin. Little potential will therefore exist for groundwater contamination from this project, and the requirements for surveillance of the groundwaters of the area will be minimal.

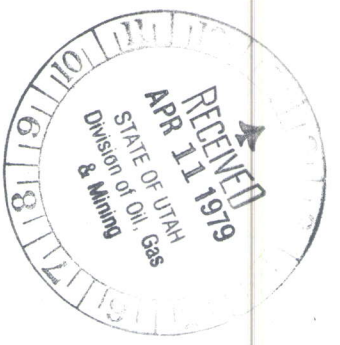
The monitoring positions (which will be located near the impoundment perimeter) for monitoring seepage from the basin during project operation will be maintained for at least five years after project termination, and observation will be maintained for at least five years after project termination, and observation will be made to see if any water has collected at those locations in the postoperational period. If water is collecting in any observation well or wells, it will be sampled and analyzed to determine its source and properties. Test results indicating a significant potential for groundwater contamination will be cause for instituting a field investigation and analysis to determine the scope of the potential problem and to develop appropriate remedies. Conceivable remedies could include installation of collector wells to intercept the contaminated flows, and transfer of the collected liquid to a safe evaporative disposal system. The possibility of groundwater contamination from the Shootering project is considered remote, and opportunities for observing and remedying any potential contamination before it becomes significant to the environment are substantial.

SUMMARY

The proposed postclosure monitoring program for the tailings disposal system is summarized as follows. All observations and measurements are to be made at 3-month intervals over a 5-year period following completion of the project closure procedures.

-Dam: visual inspection for settlement of crest and erosion downstream slope
-Spillway: visual inspection for obstructions in channel
-Groundwater: visual check for water in observation wells and seepage at toe or downstream from dam
-Tailings Cap: visual inspection for signs of wind erosion
-Radiation: change radon cups and TLDs at five monitoring stations and analyze results

ATTACHMENT #4



PLATEAU RESOURCES LIMITED
SHOOTERING CANYON PROCESSING FACILITY

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Revised Attatchment #4 (with changes shown)

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CLOSURE OF TAILINGS IMPOUNDMENT

Reclamation and restoration of the impoundment area will progress throughout the operating life of the ore processing facility, and will be concluded promptly after the termination of the processing operations. The tailings management plan for the project is designed to take advantage of the tendency of the sand and slimes fractions in the tailings to segregate during placement. Tailings will be delivered by pipeline to the impoundment area, and will be discharged through carefully placed and operated distributor pipes. The discharge pipes probably will be placed

at the elevation of the full impoundment and frequently repositioned so that they will remain at the perimeter of the impoundment as it fills. Discharged tailings will flow down the slopes of the impoundment basin; the sand fraction will be deposited near the discharge points, while the slimes will flow toward the lowest part of the basin. As filling progresses, the pipes will be repositioned to continuously extend the tailings sand beach at the level of the full impoundment and the resulting new sand beaches will be reclaimed by constructing the required cap.

It is expected that enough water may be withdrawn from the slimes by evaporation to stabilize them to the extent that they will not be displaced from the bottom of the impoundment basin by the subsequent placement of additional tailings. An important variable in the tailings placement operation is the location of the spigot discharge. By varying the distance between the point of discharge and the low part of the basin, the exposure of the flowing slimes to the atmosphere can be varied. Properly controlled discharge positions should result in well-dewatered slimes collecting in the low part of the tailings basin. Thus, at the end of the project life, a large mass of liquid slimes will not be concentrated in the central portion of the impoundment area, and there should be no difficulty in completing the cap to be placed over the entire impoundment area. By continuously stabilizing the tailings slimes as they are discharged into the impoundment, it will be possible to provide the maximum feasible burial of that portion of the tailings containing the preponderant part of the radionuclides. Also, this disposal technique should result in a well-consolidated, dense mass of low porosity, which will be effective in limiting the emanation of radon gas from the tailings.

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erosion, special care will be exercised to obtain a concentration of gravel and small rocks in the upper additional 1 foot of the cap.

It is noted that optimization in the design and construction of caps for uranium mill tailings is an evolving technology. Therefore, the plan for capping tailings from the Shootering project presented here is tentative. When the time comes to construct the cap, the best technology then available for the purpose will be employed. Since the cap construction will continue throughout most of the project operating life, this project will provide excellent opportunities for contributions to the evolution of the technology.

At this time it is not certain that net benefits may be realized by establishing vegetation over closed tailings impoundments in semiarid regions, such as the Shootering project area. With a well-established vegetative cover, water losses from the cap due to evapo-transpiration will be greater than evaporation losses from a similar cap without vegetation. It seems quite certain that maintaining as much water as possible in both the cap and the underlying tailings is beneficial in controlling radon emissions from the tailings. The surface layer of gravel and rock required on the cap to prevent wind erosion is not conducive to plant growth. It is expected that there will be continuous accretion to the tailings cap at Shootering due to retention of sediments carried onto the cap by runoff from the small tributary watershed of the basin (approximately 220 acres above the impoundment dam). The tailings cap and impoundment dam will be protected from runoff-caused erosion by a spillway to be excavated in the sandstone abutment of the dam. This spillway will have an overflow crest about 3 feet higher than the level of the completed tailings cap. Until sediments have accumulated on the cap to the level of the spillway crest, it is expected that spillway discharge will be a rare event. As sediments accrue on the cap, seeds of plants native to the area will also find their way onto the cap and natural processes will then establish a vegetative cover typical of the area on the cap. Experimental seeding of those portions of the cap constructed during the early part of project operations should

indicate whether a complete vegetative cover on the cap should be encouraged immediately after the cap is placed or if natural processes are preferable for this aspect of the project restoration program.

COSTS FOR PROJECT CLOSURE

After termination of uranium mine and processing facility operations, the surface structures and foundations will be removed from the site so the area can be reclaimed. Trash and nonsalvageable materials will be buried. Disturbed areas that will be reclaimed will be graded and topsoil will be replaced to promote revegetation. Sale of some of the equipment and materials will aid in recovery of a portion of the decommissioning cost; however, the cost of decommissioning the uranium mine and the processing facility in Shootering Canyon is estimated to be on the order of $250,000 for each element for a total estimated cost of $500,000.

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LONG-TERM SURVEILLANCE, MAINTENANCE, AND CONTROL OF TAILINGS DISPOSAL AREA

The design, construction, operation, and closure of the Shootering Canyon tailings disposal system have been planned with the objective of creating a facility that, after closure, will endure for many years without requiring either monitoring or maintenance while continuing to provide an environmentally safe and satisfactory service. However, the operation of the disposal system will be observed for five years after closure to ensure that the system is performing as intended. Accordingly, a proposed monitoring program is described in the following paragraphs. It is planned that monitoring will continue for five years after the tailings impoundment is closed. If there are any deficiencies in the system performance, they are expected to become apparent during the monitoring period and to be corrected before the monitoring program is terminated.

Factors of long-term concern with respect to uranium tailings may be summarized as follows:

-Tailings dispersal by erosion
-Contamination of groundwater
-Radon release to the atmosphere

TAILINGS DISPERSAL BY EROSION

Erosion by Water - The Shootering Canyon uranium project tailings impoundment dam will be designed and constructed with a crest extending above the maximum water level that would be reached in the impoundment area under the conditions of the maximum probable precipitation likely to occur at the site. A spillway around the left (east) abutment of the dam will divert runoff exceeding the retention capacity of the impoundment. The spillway crest will be about 3 feet higher in elevation than the top of the cap to be placed over the tailings, and the dead storage volume provided over the cap and below the spillway crest must be filled before any runoff is passed downstream from the dam. This storage is provided to maximize the capture of available moisture and thereby keep the tailings perpetually moist or wet for purposes or reducing radon emissions without reducing the safety of the structure. Overtopping of the dam crest, with consequent possible erosion, will be prevented by the spillway. The toe of the dam will be protected from erosion during periods of spillway discharge. The downstream face of the dam will not be eroded by incident rainfall.

Surveillance required to establish that the dam will continue to perform as designed (no overtopping) will include visually checking the spillway channel to see that it is unobstructed. Wind-deposited sand into the channel, rock falls or slides from the walls of the channel, and heavy vegetative incursions into the channel are conceivable types of obstructions. Channel maintenance would involve removal of such obstructions.

The dam will be constructed on a sandstone foundation. The techniques to be employed in construction of the dam will yeild a stable and

dense structure. Some deflection in both the vertical and downstream directions must be expected, however, when the dam is subjected to the intended loads. Although not expected to be significant, normal settlement under and within the dam will cause the crest of the dam to deflect with respect to the level of the spillway crest. If any settlement is noted by periodic inspections, it may be necessary to make instrument measurements to determine the amount of settlement and the consequent risk of dam overtopping. Settlement on the order of a foot or more would require a geotechnical investigation to determine the causes of the settlement. Nominal settlement due merely to internal consolidation of the dam after project closure could be remedied by adding a small amount of material to the crest, to prevent possible overtopping during heavy precipitation. Major settlement due to any cause would probably require an engineered remedy after the causes of the settlement were established. To prevent dispersal of project tailings by water erosion, it is necessary that the dam not be subjected to substantial and prolonged overtopping.

Erosion by Wind - The rock and gravel zones on the downstream slope and crest of the dam, and the rock and gravel layer to be placed at the top at the tailings cap, will prevent wind erosion of those exposed surfaces. It is expected that the thickness of the tailings cap will increase over time due to deposition of sediments transported onto the cap by runoff from the catchment area. Also, because the tailings disposal basin is effectively surrounded by natural cliffs and hills, it is expected that there will be net deposition of windborne soils over the impoundment area, rather than loss of covering over the tailings due to wind erosion. Accordingly, natural deposition will be exploited to enhance the security of the projected tailings impoundment.

Surveillance or monitoring required to determine the effects of wind on the tailings impoundment will be by visual inspection of the dam and the tailings disposal area. If there are any signs of local erosion, rather than deposition, locally available igneous rocks may be placed in the eroding areas to improve the erosion resistance of the

surface.

GROUNDWATER CONTAMINATION

The tailings management plan for the Shootering Canyon uranium plant has been developed to prevent contamination of groundwater underlying the tailings disposal area. Before tailings are placed in the basin, a clay blanket will be placed over the natural sandstone of the impoundment area to limit the rate of seepage from the tailings into the foundation rock. To reduce the amount of tailings liquids available for seepage from the impoundment, tailings will be distributed around the basin, in such a manner as to continuously provide a large wetted area exposed for evaporation. Also, if excess tailings liquids collect in the impoundment, they may be recycled to the process circuit or recirculated within the basin to increase evaporation. By keeping the tailings wet during and after placement, wind erosion and dispersion of the tailings can be minimized.

At the project site net evaporation from exposed water surfaces will average approximately 40 inches per year, which is equivalent to about 2.06 gallons per minute per acre of exposes surface. At an ore processing rate of 750 tons per day, and assuming a tailings slurry containing 45 percent solids by weight, approximately 153 gallons per minute of tailings liquids will be delivered to the impoundment. Saturated, dense, settled tailings would be expected to have a moisture content of not less than 35 percent. Based on this assumption, approximately 67 gallons per minute of the tailings liquids will be retained in the settled tailings, leaving approximately 86 gallons per minute of liquid available for evaporation and seepage from the pond. Keeping about 42 acres of the impoundment area continuously wetted should make it possible to dispose of practically all surplus tailings liquid by evaporation, leaving little available for seepage toward the ground water surface, which is at least 90 feet below the lowest point of the tailings impoundment basin. It should be noted that about 68 acres will be exposed in the impoundment area at the full basin contour level.

Since the tailings management plan provides a means for disposing of all excess tailings liquids during the project operation, no significant amount of free tailings liquid will remain in the impoundment at project termination to seep into the groundwater. Also, after the project is terminated, normal evaporation from the tailings cap will dispose of much of the incident precipitation, including runoff from the basin watershed, on the impoundment basin. Little potential will therefore exist for groundwater contamination from this project, and the requirements for surveillance of the groundwaters of the area will be minimal.

The monitoring positions (which will be located near the impoundment perimeter) for monitoring seepage from the basin during project operation will be maintained for at least five years after project termination, and observation will be maintained for at least five years after project termination, and observation will be made to see if any water has collected at those locations in the postoperational period. If water is collecting in any observation well or wells, it will be sampled and analyzed to determine its source and properties. Test results indicating a significant potential for groundwater contamination will be cause for instituting a field investigation and analysis to determine the scope of the potential problem and to develop appropriate remedies. Conceivable remedies could include installation of collector wells to intercept the contaminated flows, and transfer of the collected liquid to a safe evaporative disposal system. The possibility of groundwater contamination from the Shootering project is considered remote, and opportunities for observing and remedying any potential contamination before it becomes significant to the environment are substantial.

SUMMARY

The proposed postclosure monitoring program for the tailings disposal system is summarized as follows. All observations and measurements are to be made at 3-month intervals over a 5-year period following completion of the project closure procedures.

-Dam: visual inspection for settlement of crest and erosion downstream slope
-Spillway: visual inspection for obstructions in channel
-Groundwater: visual check for water in observation wells and seepage at toe or downstream from dam
-Tailings Cap: visual inspection for signs of wind erosion
-Radiation: change radon cups and TLDs at five monitoring stations and analyze results

Deletion

Change in Sentence

Change word

Addition of word